EPA/CPG Modeling Meeting

LPR/NB RI/FS Hydrodynamic and Sediment Transport Modeling

Nov 14, 2013

Overview

- Model version used for HD/ST projection runs presented to EPA HQ
- CPG and EPA ST model comparison
- Current status of HD/ST models

Model Version for Projection Runs

- **Model version used for projection runs presented to EPA HQ**
  - Hydrodynamic model – developed by EPA (Jan 2008)
  - Sediment transport model – same as described in the Jan 2013 memo *"Status of the CPG's Sediment Transport Model"*
    - Applied over WY1995 to WY2012
    - Model-data comparisons over range of discharges, from low-flows to extreme events (Mar 2010 16,000 cfs event; Hurricane Irene)
      - Suspended solids – time-series from ABS/OBS, water samples
      - Solids fluxes
      - Bathymetric change
    - Reproduces major processes
      - Estuarine processes – intra- and inter-tidal variability in TSS, tidal pumping, exchange with Newark Bay
      - Scour during high-flow events and infilling during low-flow periods
    - Applied to 1950s post-dredge condition – test of infilling following last major dredging event
  - Received EPA comments on Jan 2013 memo in April 2013
    - No major criticisms on model formulations, inputs, or behavior (processes/results)
    - Several minor comments, currently being reviewed/implemented

Model Version for Projection Runs (Contd.)

- Except as noted below, parameterization and inputs as described in Jan 2013 memo
  - Bathymetry within navigation channels in Newark Bay (and Kills) modified to reflect 50' post-deepening conditions (developed by EPA based on design depths)
  - Projection runs hot-started using restart files at the end of WY2012

EPA-CPG Sediment Transport Models

- **Major features of EPA* and CPG sediment transport models**

CPG Model	EPA Model*

• ECOM-SEDZLJS
• Two layer bed model with
  ○ Fluff layer for intra-tidal suspended solids dynamics – parameterized from an analysis of PWCM TSS data, consistent with Gust microcosm data
  ○ Underlying less erodible layer, predominantly active during events – parameterized using LPR Sedflume data, with critical shear stress profile calibrated within range of data
• 2 cohesive and 3 non-cohesive classes
• Class-specific constant settling velocity for cohesives
• Decoupled hydrodynamics and sediment with bathymetric feedback via continuity correction (~15 days on average)
• Sediment initial conditions for grain size distribution and dry density based on distinction inside/outside former navigation channel and spatial averages
	• ECOM-SEDZLJS
	• Two layer bed model with
	  ○ Fluff layer for intra-tidal suspended solids dynamics – parameterized using Gust microcosm data
	  ○ Underlying less erodible layer, predominantly active during events – based on data from LPR consolidation experiments
	• 1 cohesive and 3 non-cohesive classes
	• Concentration-dependent settling velocity for cohesive class
	• Coupled hydrodynamics and sediment transport with frequent (every 10 timesteps) bathymetric feedback
	• Sediment initial conditions for grain size distribution and dry density applied over geomorphic units

* Interpretation based on *"Report of the Peer Review of Sediment Transport, Organic Carbon and Contaminant Fate and Transport Model"*, Sep 2013

CPG Hydro/Sed. Transport Model – Current Status

- **LPR model refinement**
  - Bathymetry
  - Bed bulk density profile
  - Grain size distribution at solids boundaries
  - Dundee Dam solids boundary condition rating curve
- **Linked calibration with the CFT model**
  - HD & ST model comparison to salinity and TSS data from CWCM events
- **Analysis of ship-track data and propeller scour – LPR and NB**
- **Newark Bay system understanding and model development**
  - Wave model
  - Analysis of Sedflume data
  - Refinement of model initial conditions (bed grain size distribution, dry density)
  - 2012 bathymetry
  - Model calibration and validation